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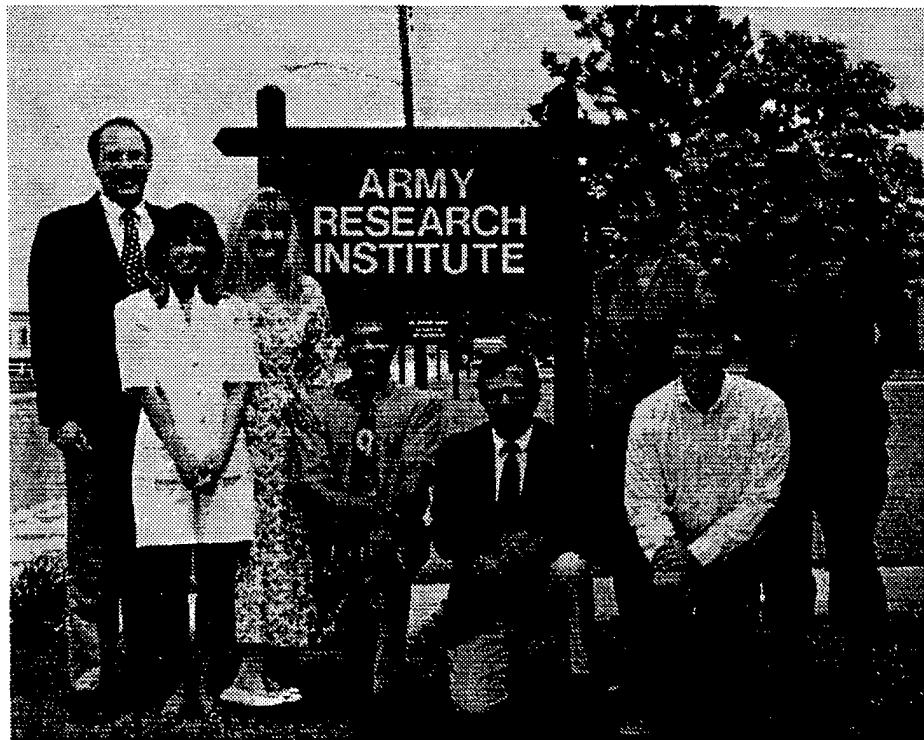
FOREWORD

In 1987, the Army Research Institute established a research unit at Fort Gordon, Georgia to perform research to improve communications and electronics training for the U.S. Army Signal School. In the ensuing seven-year period, the Fort Gordon Research Unit made numerous contributions to training in this expanding, high-technology environment, and maintained a high rate of productivity.

On 30 June 1994, as a result of downsizing, this research unit was closed and its functions transferred to other ARI research units.

In the tradition of military unit histories, this report summarizes the programs and accomplishments of the Fort Gordon Research Unit of the Army Research Institute, and provides a reference list of documents reflecting those accomplishments.

EDGAR M. JOHNSON
Director

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Background

The Army Research Institute for the Behavioral and Social Sciences (ARI) established a Field Unit at Fort Gordon in March 1987. The Field Unit was established to support the U.S. Army Signal Center and School and Fort Gordon (USASC&FG) at the suggestion of the Deputy Chief of Staff for Personnel (DCSPER). The need for the Field Unit was identified during a 1986 Signal Functional Area Review in which several manpower, personnel, and training research issues arose. The Signal Corps is the Army's third largest branch.

The Army's Long Range Training Plan (DCSOPS and TRADOC), at that time, emphasized the requirement to "exploit the use of technology in all training activities and systems" and "increase reliance upon simulation, simulators, and training devices to develop proficiency."

The ARI Fort Gordon Field Unit, therefore, had the mission of conducting research to support the development of technology-based improvements to Army communications and electronics education and training. A secondary mission was to perform research to address manpower and personnel concerns associated with the design of new Signal systems and the restructuring of existing Military Occupational Specialties (MOS).
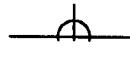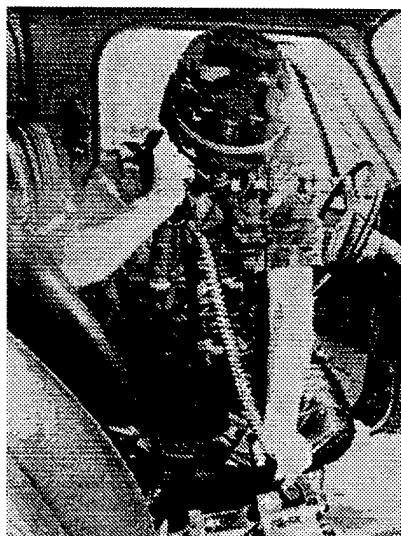
Research Products and Programs

Diminishing training resources coupled with the availability of sophisticated high-technology information management equipment pointed to the need for more efficient training methods and technologies. As well, Fort Gordon long-range planning documents indicated a need for improvements in information management, specifically in the development of training and decision aids for lower echelon command and control (C2). Because approximately 30,000 soldiers were trained each year at the Signal School, new skill acquisition and sustainment training strategies and technologies were also needed to reduce training expenses as well as improve combat effectiveness.

Training strategies and support systems were also required for the rising number of General Purpose Users (GPU), non-Signal soldiers operating communications equipment, who frequently have difficulty maintaining adequate skill levels on Signal systems. Experimental research, development, test, and evaluation (RDTE) work was required to demonstrate and evaluate the effectiveness of alternative training strategies, techniques, and approaches for communications (operator and maintainer) and other forms of information management.

Highlights of the ARI Fort Gordon Field Unit focus in addressing these information management concerns follows.

High Transfer Training Methodology

One major contribution was the development, application, and evaluation of improved training strategies such as the High Transfer Training (HITT) methodology.

The HITT methodology was originally developed for use at the Signal School. This methodology now augments the current Systems Approach to Training used at all TRADOC schools. HITT maximizes learning transfer across a family of related systems, situations, and tasks by identifying and emphasizing common knowledges and skills. The HITT methodology has been accepted at TRADOC as a component of the future Automated Systems Approach to Training (ASAT) program.

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Application of Emerging Training and Job Aiding Technologies to Signal Problem Areas

Several behavioral and computer-based technologies were explored as potential instructional enhancements. One major thrust for research was the development and evaluation of low-cost computer-assisted training, to include the use of artificial intelligence and simulations, for Signal training requirements. A series of prototype tutors and simulations were developed for Signal Soldiers and GPU. These tutors were developed for delivery on personal computers available in most Active and Reserve Component units. One GPU tutor for the Mobile Subscriber Equipment Radio-Telephone Terminal (MSRT) was developed for approximately $120,000. This tutor allows the GPU to practice all primary procedures required for operation of the MSRT. In other words, the simulation provides all the sound and visual cues that an operator would hear and see if the entire net was in operation. To perform these same procedures in the field requires at least four soldiers available to man the over $5,000,000 worth of equipment. Many Active and Reserve sites do not have all the Mobile Subscriber Equipment available on a regular basis. Over 9,000 soldiers are required to maintain proficiency on the MSRT, yet research has shown that very significant skill decay occurs after 6 to 8 weeks of nonuse. The MSRT tutor provides a means for soldiers to maintain the desired skill proficiency levels at a very low cost.
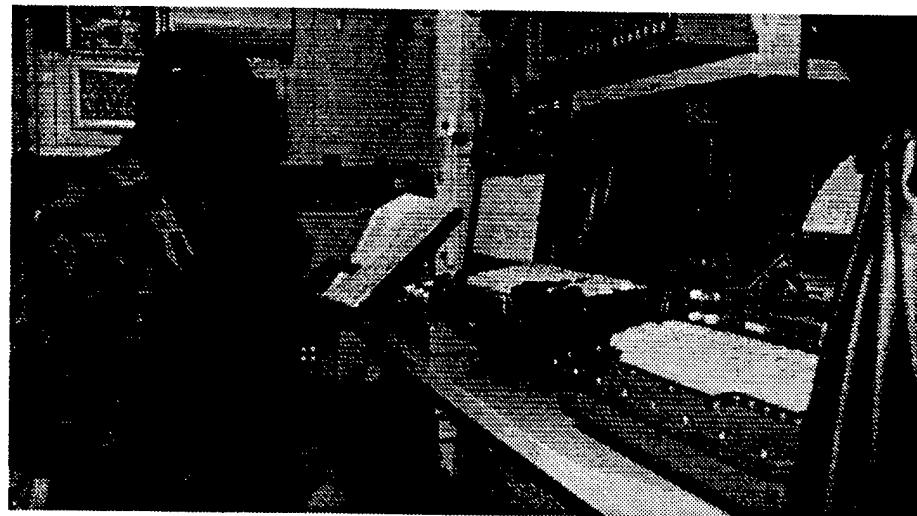
Distributed Interactive Simulation

Another major emphasis was on research to integrate Signal variables into a new form of training technology called distributed interactive simulation (DIS). Simulation Network (SIMNET) was the first operational example of this type of training. Other DISs are in the development process.

Existing simulations for inter- and intra- battlefield operating systems training did not include Signal variables; perfect communications and automation were assumed. Research would determine the Signal variables (e.g., range effects, terrain effects) that have the highest simulation payoff, and the appropriate training strategies for training division/brigade/battalion commanders and their staffs on the need for and the results of Signal planning. An important aspect of this is not only training these personnel but also training Signal officers in planning for Signal as a part of battle planning and interacting with staff personnel. The major overall accomplishment was the articulation of the need to include Signal realism and personnel in training simulations for other audiences (e.g., commanders, staffs, GPU). The next stages of this research would be to develop and exercise simulations which include Signal realism. The outcomes of these simulations would be used to document the problems that occurred and introduce solutions into appropriate training programs and doctrine publications.

Military Occupational Specialty Restructuring Program

The MOS Restructuring Program was another major research thrust. The Signal School and the Total Army Personnel Command (PERSCOM) were joint sponsors for the research. MOS restructuring was defined as the creation of a new job in terms of the cluster of tasks for which the future MOS holder will be responsible. PERSCOM described it as the classification and structure process. As a part of this research, several tools were created that were named collectively the MOS Restructuring Decision Support Technology (DST). The prototype tools were developed and evaluated through application to current problem areas. Several of these applications resulted in data that were very useful to several sponsors. For example, several components of the DST were used in analyzing a Field Artillery 13C, E, P, and D MOS restructuring problem. The prototype tools provided very useful data and recommendations that were adopted. Some of the tools were automated and designed to be compatible with databases that most TRADOC proponency offices use. The program was very successful and was transferred to ARI Headquarters so that it could be used as a primary vehicle for tri-service research on MOS restructuring and force structure. The tools and research elements continue to be developed, refined, and directed toward Department of Defense utilization.

The National Science Center Task Force

A strong relationship was developed between the Field Unit and the National Science Center (NSC) Task Force, a TRADOC activity located at Fort Gordon. ARI consistently acted as an independent evaluation element for Math and Science Summer Camps conducted by the NSC. The 1993 NSC Expansion Program Pilot Math and Science 2000 was directed by the Army Chief of Staff with the intent of using Army resources to enhance middle and high school students' interest in and appreciation of mathematics problem solving and science. Because of the magnitude and high-level interest of the pilot program, the NSC General Officer Steering Committee requested that the ARI Field Unit perform an independent evaluation of the program. The evaluation of this program and an associated JROTC Camp

program was completed and briefed, as were evaluations of preceding summer camps and workshops. ARI staff also participated in several NSC task forces and planning committees, as requested by the Commanding General of Fort Gordon.

Technical Advisory Service

In addition to performing research, ARI also provided Technical Advisory Service (TAS) to USASC&FG as needed. TAS support drew upon the behavioral science expertise of ARI staff members to address short-term problems.

Examples of TAS problems that were addressed for USASC&FG include determining the appropriate ability levels for certain MOS; providing input for a survey of Signal Soldiers who took part in Operation Desert Storm; participating in an evaluation of the performance time standards and personnel requirements for the erection and disassembly of the 30-meter mast antenna; and guiding development of the evaluation elements of the first Report Card for Fort Gordon 2000, formed under America 2000.
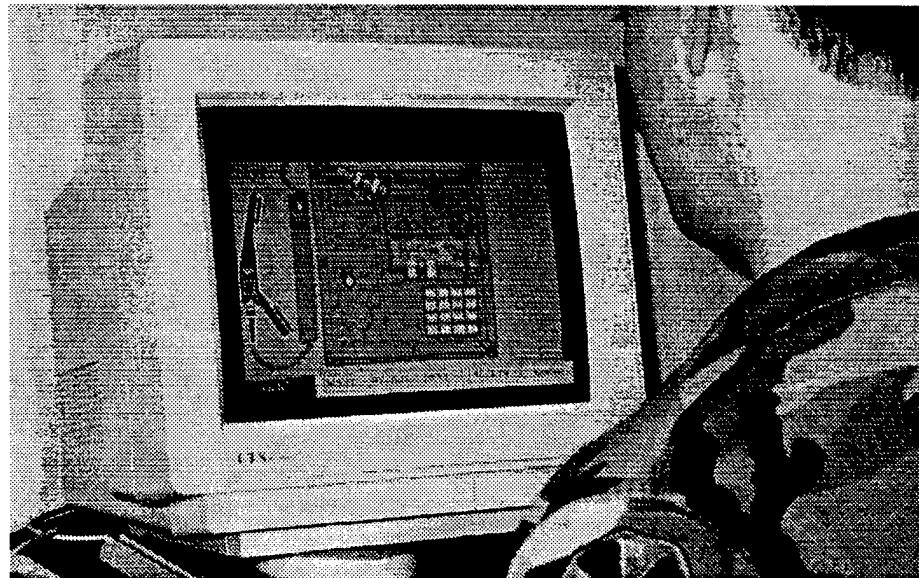
Cooperative Research Programs

The Fort Gordon Field Unit also developed very strong ties with faculty and graduate students from Augusta College and the University of Georgia. Cooperative research programs were established so that University of Georgia professors such as Dr. Mike Orey and Dr. Don Potter participated in Summer Faculty appointments at the Field Unit. These professors, as well as several others, also participated in short Senior Consortium Fellowship consultant programs. Through these programs, several of the faculty from Augusta College and the University of Georgia became familiar with the applied research focus of the Field Unit. Cooperative planning resulted in several collaborative efforts such as a proposal accepted by the Georgia Research Alliance for work performed by Clark Atlanta, University of Georgia, and ARI researchers on skill acquisition and decay issues associated with instructional technology applications to communications systems. Graduate students, several funded under the Consortium of Universities Research Program, worked under the guidance of both ARI personnel and their major professors. This cooperative and coordinated program was a significant personnel multiplier and focused several very talented professors and graduate students on Signal research issues.

Publications

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Gillis, P. D. (1993). ICACT: An instruction and control architecture for classroom training. *Educational Technology, 41-45.*

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Legree, P. J., Gillis, P. D., & Orey, M. A. (1993). The quantitative evaluation of ITS applications: Product and process criteria. *Journal of Artificial Intelligence in Education, 4*(2), 209-226.

Orey, M. A., Park, J. S., Chanlin, L. J., Gillis, P. D., & Legree, P. J. (submitted). An extensive evaluation of an ITS using traditional and non-traditional methods. *Journal of Cognitive Science.*

Orey, M. A., Park, J. S., Chanlin, L. J., Jih, H., Gillis, P. D., Legree, P. J., & Sanders, M. G. (1992). High bandwidth diagnosis within the framework of a microcomputer-based intelligent tutoring system. *Journal of Artificial Intelligence in Education, 3*(1), 63-80.

Orey, M. A., Trent, A. P., & Young, J. P. (1993). Development efficiency and effectiveness of alternative platforms for intelligent tutoring. *Journal of Artificial Intelligence in Education.*

Orey, M. A., Trent, A. P., & Young, J. P. (1993). *Development efficiency and effectiveness of alternative platforms for intelligent tutoring for the mobile subscriber remote ratio-telephone terminal* (ARI Research Note 93-16). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (AD B174 762L)

Plummer, K. H., Gillis, P. D., Legree, P. J., Sanders, M. G. (1992). The development and evaluation of a job aid to support mobile sub-scriber radio-telephone terminal (MSRT). *Performance Improvement Quarterly, 5*(1), 90-105.

Plummer, K. H., Legree, P. J., & Gillis, P. D. (1991). *The development and evaluation of a job aid to support Mobile Subscriber Radio-Telephone Terminal (MSRT)* (ARI Technical Report 937). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (AD A243 228)

Potter, W. D., Pitts, R. W., Gillis, P. D., Young, J. F., & Caramdre, J. (1992). IDA-NET: An intelligent decision aid for battlefield communications network configuration. *Proceedings of the Eighth IEEE Conference on Artificial Intelligence for Applications*, 247-253.

York, W. J. (1992). Army Research Institute supports the Signal Center: A case study. *The Army Communicator, 17*(1), 20-23.

Presentations

Finley, D. L., Singleton, J. M. H., Drago, J. W., Sanders, M. G. (1993, October). *High transfer training (HITT) methodology: Further evidence of training benefits.* Paper presented at the 1993 Human Factors Society 37th Annual Meeting, Seattle, WA.

Gillis, P. D., Legree, P. S., Pitts, R. W., & Sanders, M. G. *Computer based training for mobile subscriber equipment.* Discussion panel broadcast during Teltrain IV: Technology in the Classroom. Televised broadcast from Fort Gordon, GA, September 24, 1991.

Kovarik, V., & Gillis, P. D. (1991, November). *U.S. Army developments in windows-based intelligent training.* Paper demonstrated at the 1991 Conference on Intelligent Computer-Aided Training, Houston, TX.

Orey, M. A., Legree, P. J., Gillis, P. D., & Bloom, E. (1991, February). *A plan for the evaluation of intelligent tutoring systems.* Paper presented at the Thirteenth Association for Educational Communications and Technology, Orlando, FL.

Orey, M. A., Park, J. S., Chanlin, L. J., & Gillis, P. D. (1992, November). *Does ITS help? and, is an ITS error diagnosis a remedy?* Paper presented and published in proceedings of the Association for the Development of Computer-Based Instructional Systems, Norfolk, VA.

Orey, M. A., Park, J. S., Chanlin, L. J., Gillis, P. D., & Legree, P. J. (1991). *Intelligent multimedia training for the Signal Corp.* Paper presented at the 1991 Conference on Intelligent Computer-Aided Training, Houston, TX.

Orey, M. A., Park, J. S., Chanlin, L. J., Gillis, P. D., & Legree, P. J. (1992, January). *An evaluation of an ITS based on social interaction research methodology.* Paper presented at the Southeast Cognitive Science Conference, Atlanta, GA.

Orey, M. A., Park, J. S., Chanlin, L. J., Gillis, P. D., & Legree, P. J. (1992, March). *Evaluation of a high bandwidth intelligent tutoring system for electronics troubleshooting.* Paper presented at the annual meeting of the Eastern Educational Research Association, Hilton Head, SC.

Orey, M. A., Trent, A. P., & Young, J. P. (1993, August). *Development efficiency and effectiveness of alternative platforms for intelligent tutoring.* Paper presented at the World Conference on Artificial Intelligence in Education, Edinburgh, Scotland.

Potter, W. D., Chang, F. L., Gillis, P., & Sanders, M. (1993, June). *An ITS expert module to aid battlefield communications network configuration.* Paper presented at the Sixth International Conference on Industrial & Engineering Applications of Artificial Intelligence & Expert Systems in the City Chambers, Edinburgh, United Kingdom.

Potter, W. D., Gillis, P. D., Pitts, R. W., & Young, J. F. (1992, March). IDA-NET: *An intelligent decision aid for battle-field communications network configuration.* Paper presented at Eighth IEEE Conference of AI for Applications, Monterey, CA.

Shipman, M. G., Lowry, C. A., & Sanders, M. G. (1992, August). *Application and evaluation of HITT: A generic training methodology.* Paper presented at the 100th Annual Meeting of the American Psychological Association, Washington, DC.

Shipman, M. G., Lowry, C. A., & Sanders, M. G. (1992, August). *How far can military training transfer? Some surprising findings.* Paper presented at the 100th Annual Meeting of the American Psychological Association, Washington, DC.

Spaulding, R. M., Smith, J. C., Sommer, T., & Sanders, M. G. (1992, August). *Effectiveness of pre-service basic electronics training for military occupational skills.* Paper presented at the 100th Annual Meeting of the American Psychological Association, Washington, DC.

Fort Gordon Personnel History

Establishment

Fort Gordon was established on March 2,1987, to bridge the gap between the fast-paced growth of electronic technologies and the operators and maintainers. USASC and Fort Gordon requested ARI establish an on-site office to facilitate the conduct of research on applying technologies to improve training.

Staff

From the creation of the Field Unit, the personnel and positions were the following:

Dr. Michael Sanders, Field Unit Chief
Dr. Peter Legree, Research Psychologist
Ms. Dorothy Finley, Research Psychologist
Dr. Paul Tremont, Research Psychologist
Dr. William York, Jr., Research Psychologist
Dr. Philip Gillis, Research Psychologist
Dr. David Johnson, Research Psychologist, assigned to NPRDC
MAJ John Smith, Jr., Research and Development Coordinator
SFC James Drago, Research and Development Coordinator*
MSG Craig Lowry, HITT Coordinator*
Ms. Ann Rodgers, Administrative Support Assistant*
Ms. Norma Cone, Secretary
Ms. Cathy Smith, Secretary*

*Assigned to ARI Fort Gordon Field Unit but on Fort Gordon TDA.

The Fort Gordon Field Unit was closed June 30, 1994.